

CHEMISTRY

BOOKS - NTA MOCK TESTS

STATES OF MATTER : GASES AND LIQUIDS

Single Choice Question

1. The third virial coefficient for real gas is $2 \times 10^{-2} (\text{L mole}^{-1})$. The molar volume of

gas at 27°C and 5 atm Pressure may be-

A. 5.12 L

B. 5.00 L

C. 5.18 L

D. 5.06 L

Answer: D



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2. A closed vessel contains an equal number of molecules of N_2 and O_2 at a total pressure of 650 mm of Hg. If N_2 is completely removed the pressure will,

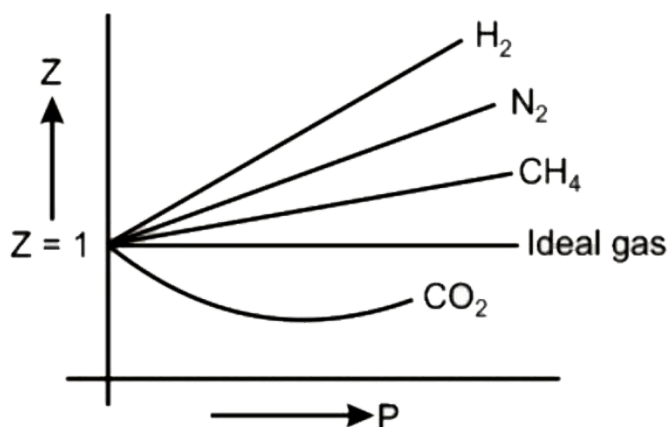
- A. drop to $650/3$
- B. drop to $650/2$
- C. remain unchanged
- D. become 650×2 .

Answer: B

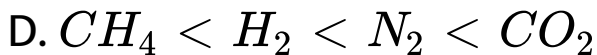
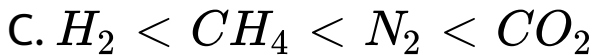
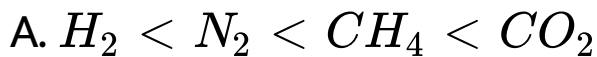


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3. Consider the graph between compressibility factor Z and pressure P :



The correct increasing order of ease of liquefaction of the gases shown in the above graph is:



Answer: A



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4. A cylinder contains nitrogen gas and a small amount of liquid water at a temperature 25°C . (The vapour pressure of water is 23.8 mm Hg.)

The total pressure is 600 mm Hg. A piston is pushed into the cylinder until the volume is halved. What is the final total pressure? (In atm)

A. 1176.2 atm

B. 1.55 atm

C. 1152.4 atm

D. 1.98 atm

Answer: B



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5. The average molecular speed is greatest in which of the following gas samples ?

A. 1.0 mol N_2 at 560 K

B. 0.50 mol Ne at 500 K

C. 0.20 mol CO_2 at 440 K

D. 2.0 mol of He at 140 K

Answer: D



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6. A container contains some gas molecules and each have mass 10^{-26} kg and volume of the container is 1 dm^3 . The RMS velocity of gas molecules is 1 km sec^{-1} then what is the temperature of gas molecules. (Given: $N_A = 6 \times 10^{23}$, $R = 8\text{ J mol}^{-1}\text{ K}$)

A. 298 K

B. 25 K

C. 150 K

D. 2500 K

Answer: C



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7. Van der Waal's equation for a gas is stated as,

$$p = \frac{nRT}{V - nb} - a\left(\frac{n}{V}\right)^2.$$

This equation reduces to the perfect gas

equation, $p = \frac{nRT}{V}$ when,

A. temperature is sufficiently high and
pressure is low

B. both temperature and pressure are very low.

C. both temperature and pressure are very high.

D. both temperature and pressure are very high.

Answer: A



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8. At 10°C , the density of a fixed mass of an ideal gas divided by its pressure is X . At 110°C , this ratio would be

A. $\frac{10x}{110}$

B. $\frac{283x}{383}$

C. x

D. $\frac{383}{283} X$

Answer: B



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9. Calculate the total pressure in a 10.0 L cylinder which contains 0.4 g helium, 1.6 g oxygen and 1.4 g nitrogen at 27° C

$$\left\{ R = 0.082 \text{ LatmK}^{-1} \text{ mol}^{-1} \right\}$$

A. 0.492 atm

B. 49.2 atm

C. 4.92 atm

D. 0.0492 atm

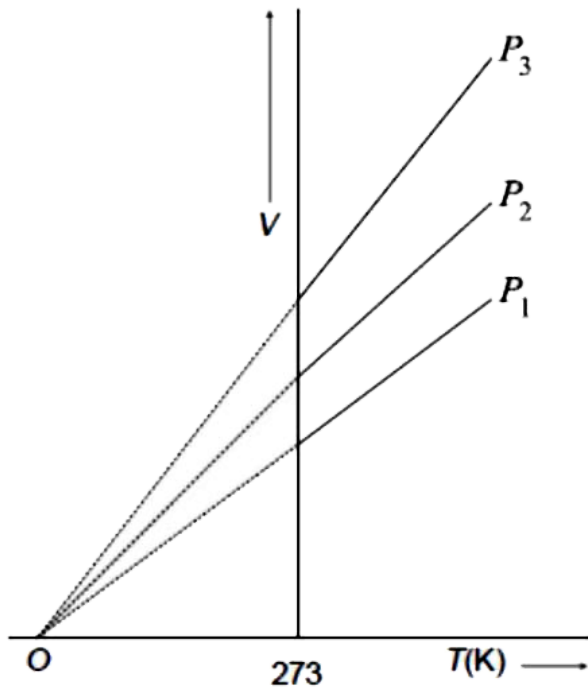
Answer: A



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10. The volume-temperature graphs of a given mass of an ideal gas at constant pressures are shown below. What is the correct order of

pressures ?



A. $p_1 > p_3 > p_2$

B. $p_1 > p_2 > p_3$

C. $p_2 > p_3 > p_1$

$$D. p_2 > p_1 > p_3$$

Answer: B



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11. An open vessel at 27°C is heated until $3/8$ th of the air in it has been expelled. Assuming that the volume remains constant, calculate the temperature at which the vessel was heated

A. 307°C

B. 107°C

C. 480°C

D. 207°C

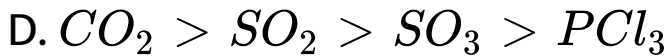
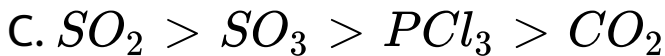
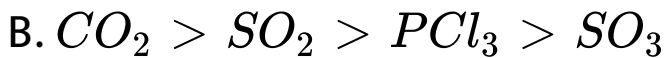
Answer: D



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12. The rates of diffusion of SO_2 , CO_2 , PCl_3 and SO_3 are in the following order:

A. $PCl_3 > SO_3 > SO_2 > CO_2$



Answer: D

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13. The density of a gas-filled electric lamp is 0.75, after the lamp has been switched on, the pressure in it increases from 4×10^4 Pa to 9×10^4 Pa. What is increase in U_{rms} ,

assuming the volume at gas in the lamp is constant.

A. 100

B. 300

C. 200

D. 400

Answer: C



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14. The rms speed of N_2 molecules in a gas is u . If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atoms, the rms speed becomes

A. $2u$

B. $4u$

C. $14u$

D. $\sqrt{2}u$

Answer: A



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15. A gas obeys the equation of state $P(V_m - b) = RT$. The slope of the isochore will be

A. negative

B. zero

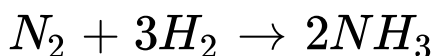
C. $R(V_m - b)$

D. $\frac{R}{P}$

Answer: C



16. In the following reaction, we start with 2 mol of N_2 and 5 mol of H_2 exerting a total pressure of 7 atm at a given temperature in a closed vessel. When 50% of N_2 is converted into NH_3



Partial pressure of NH_3 is :

A. 2.8 atm

B. 2 atm

C. 3.2 atm

D. 4 atm

Answer: B



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17. The weight of 350 mL of a diatomic gas at 0°C and 2 atm pressure is 1g. The weight of one atom is

(N is the Avogadro's Number)

A. $16 / N$

B. $32/N$

C. $16 N$

D. $32 N$

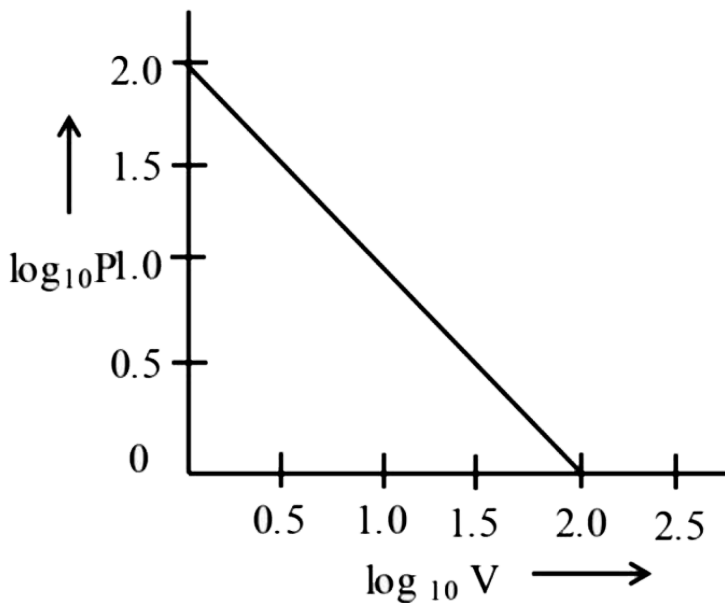
Answer: A



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18. For the given isotherm for one mole of an ideal gas, which follows Boyle's law, what will be the value of temperature ($R = 0.0821$ (L

atm/mol/K))



A. $8.2 \times 10^{-4} \text{ K}$

B. 1220 K

C. 947 K

D. 18 K

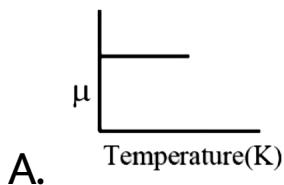
Answer: B

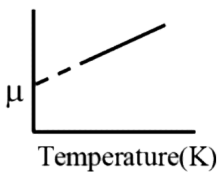


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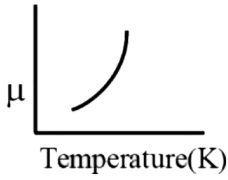
19. An ideal gas is initially at temperature T and volume V . It's volume increases by ΔV due to an increase in temperature of ΔT , pressure remaining constant. The quantity

$\mu = \frac{\Delta V}{V\Delta T}$ varies with temperature as -

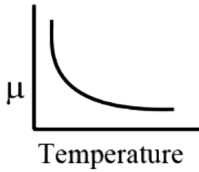




B.



C.



D.

Answer: D



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20. What is the correct relation between critical temperature T_c , Boyle's temperature

T_B and inversion temperature T_i .

A. $T_i > T_B > T_C$

B. $T_C > T_B > T_i$

C. $T_B > T_i > T_c$

D. $T_B = T_c < T_i$

Answer: A



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21. If the rate of diffusion of A is 5 times that of B, what will be the density ratio of A and B ?

A. 1 : 25

B. 1 : 5

C. 25 : 1

D. 5 : 1

Answer: A



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22. At what temperature will the molar kinetic energy of 0.3 mol of He be the same as that of 0.4 mol of argon at 400 K ?

A. 700 K

B. 500 K

C. 800 K

D. 400 K

Answer: D



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23. A mixture of dihydrogen and dioxygen at one bar pressure contains 20% by weight of dihydrogen. Calculate the partial pressure of dihydrogen.

A. 0.8 bar

B. 0.4 bar

C. 1.6 bar

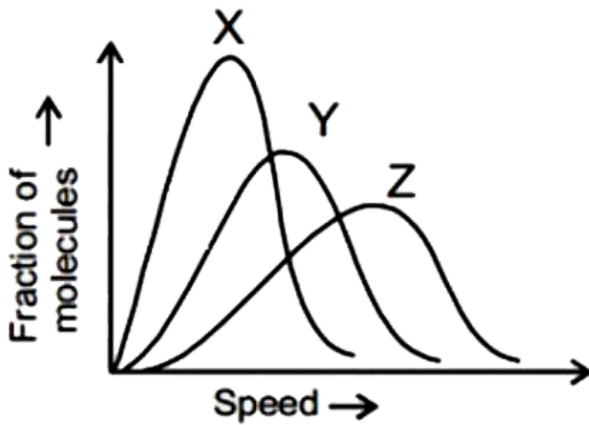
D. 3.2 bar

Answer: A



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24. Consider the following graph:



X, Y and Z can be respectively.

A. Ne, Ar and Xe

B. Ar, Xe and He

C. Kr, Ar and Ne

D. Ar, He and Ne

Answer: C



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25. A sample of air contains only N_2 , O_2 and H_2 . It is saturated with water vapours and the total pressure is 640 torr. The vapour pressure of water is 40 torr and the molar ratio of $N_2 : O_2$ is 3:1. The partial pressure of N_2 in the sample is:

A. 480 torr

B. 600 torr

C. 525 torr

D. 450 torr

Answer: D

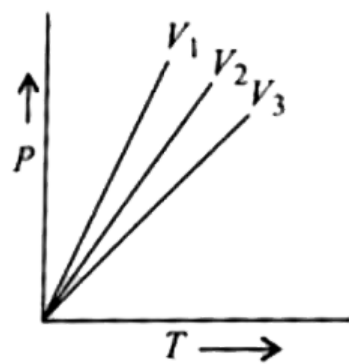


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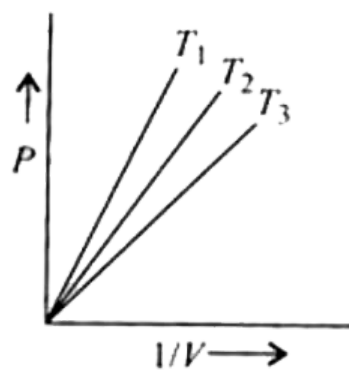
26. For 1 mol of an ideal gas, $V_1 > V_2 > V_3$ in fig. 1, $T_1 > T_2 > T_3$ in fig. 2, $P_1 > P_2 > P_3$ in fig. 3, and $T_1 > T_2 > T_3$ in fig. 4, then which

curves are correct.

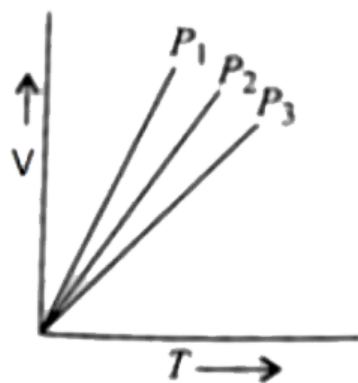
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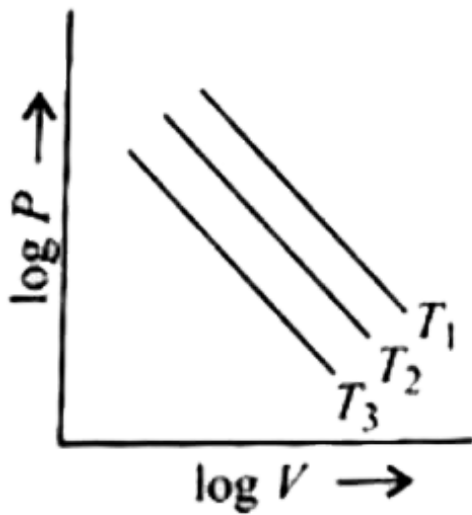


2.



3.





A. 1,2

B. 1,2,3

C. 2,4

D. 1,3,4

Answer: C



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27. A gas can be compressed to a fraction of its volume. The same volume of a gas can be spread all over a room. The reason for this is that

A. The volume occupied by molecules of a gas is negligible as compared to the total volume of the gas

B. Gases consist of molecules which are in a state of fixed motion

C. Gases consist of molecules having very large inter - molecular space which can be reduced or increased.

D. None of these

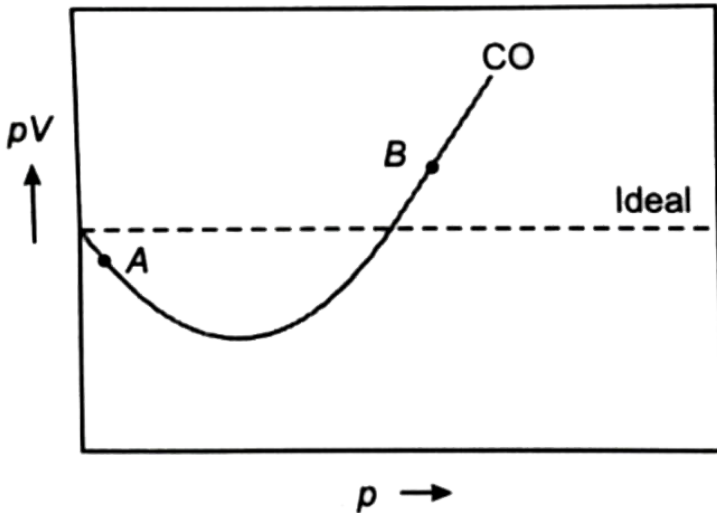
Answer: C



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28. For Co, isotherm is of the type as shown.

Near point A, compressibility factor Z is:



- A. $\left(1 + \frac{b}{V}\right)$
- B. $\left(1 - \frac{b}{V}\right)$
- C. $\left(1 + \frac{a}{RTV}\right)$

D. $\left(1 - \frac{a}{RTV}\right)$

Answer: D



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29. The ratio of rates of diffusion of gases X and Y is 1:5 and that of Y and Z is 1:6. The ratio of rates of diffusion of Z and X is:

A. 1:30

B. 1:6

C. 30:1

D. 6:1

Answer: C



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30. Under which of the following conditions do real gases approach the ideal gas behavior ?

A. Low temperature and high pressure

B. High temperature and high pressure

C. High temperature and low pressure

D. Low temperature and low pressure

Answer: C



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